UNIVERSITY OF LIVERPOOL

Geology with Physical Geography MESci

COURSE DETAILS

- A level requirements: AAB
- UCAS code: FF68
- Study mode: Full-time
- Length: 4 years

KEY DATES

- Apply by: 25 January 2023
- Starts: 25 September 2023

Course overview

Drawing on the complementary expertise of staff in geology and physical geography, this integrated degree programme provides a clear view of the controlling processes that link landscape evolution with environmental change and natural events that impact human activity.

INTRODUCTION

The Earth surface system is dynamic and diverse, with changes driven by the interplay of physical, chemical, geological and biological processes in a wide range of environments.

Fieldwork in years two and three at Liverpool is designed specifically for this degree programme integrating geology and geomorphology. You have academic tutors from both disciplines in years one and two.

The first three years of the MESci programme are shared with the BSc programme. The final year provides a wider choice of taught modules and a comprehensive fieldwork programme. In addition, you have the opportunity to design and undertake a major individual research project that will provide you with skills in analysis, synthesis, problem solving, and reporting.

The unique range of skills that MESci Geology with Physical Geography students develop make them attractive to employers in the geotechnical and resource exploration industries, as well as the environmental monitoring, surveying and planning sectors.

Your training will focus on practical and quantitative aspects of geological and geographical science through study of the interaction of surface and near surface processes on the Earth.

Research-based dissertations on topics of your choice are undertaken in years three and four on projects that are geological

and/ or geomorphological. Year four includes the opportunity for an additional field courses to Tenerife (volcanic and surface processes).

A number of the School's degree programmes involve laboratory and field work. Fieldwork is carried out in various locations, ranging from inner city to coastal and mountainous environments. We consider applications from prospective disabled students on the same basis as all other students, and reasonable adjustments will be considered to address barriers to access.

WHAT YOU'LL LEARN

- The comprehensive study of surface and near-surface processes
- Specific practical skills necessary for a career in Earth Sciences
- Transferable life-skills and independent thinking
- 11 days of fieldwork in year one
- 18 days of fieldwork in year two
- 14 days of fieldwork in the Betics, Spain

ACCREDITATION

This degree is accredited by the Geological Society of London, satisfying the requirements of Fellowship and Chartered Geologist status.

Course content

Discover what you'll learn, what you'll study, and how you'll be taught and assessed.

YEAR ONE

In year one, students take seven compulsory modules and select one optional module as outlined below.

Fieldwork involves:

- 1 day in North England (October)
- 8 days in Pembrokeshire (Easter)
- 2 days in NW England/Wales

ENVS117 is a compulsory module for those without A level Maths or Physics at grade C or above. ENVS153 is a compulsory module for those without A level Chemistry at grade C or above. You should discuss this with your programme director at the start of the academic session.

COMPULSORY MODULES

EXPERIMENTS IN PHYSICAL GEOGRAPHY (ENVS120)

Credits: 15 / Semester: semester 1

The module uses laboratory experiments to allow students to gain firsthand experience of some fundamental physical, biological and chemical processes underlying physical geography, aimed primarily at interactions between people and their physical environment. It is designed to provide a foundation for environmental modules in the second and third years.

This module comprises multiple whole-day practical sessions, each designed to give students first-hand experience of a topic important in understanding our changing environment. Dedicated computer practicals are also run to provide training in use of EXCEL, MINITAB, and basic inferential statistics. Students get formal feedback in each assessed week (1 poster per group). However, perhaps most valuable is the feedback obtained informally via discussions during the sessions.

INTRODUCTION TO FIELD GEOLOGY (ENVS109)

Credits: 15 / Semester: semester 2

This field module provides a basic training in field techniques and gives students practical experience working with a wide range of rock types and tectonic structures to solve geological problems. Students gain experience in recording field data and use their own data to interpret geological processes and environments.
The module is assessed by means of an individual fieldwork portfolio, and a group synthesis poster completed after the field class.

SEDIMENTARY ROCKS AND FOSSILS (ENVS118)

Credits: 15 / Semester: semester 1

This module provides a basic introduction to sedimentology and palaeontology. Students learn about the origin of sediment, sedimentary processes and structures and the ways in which sediments are converted into solid rock. The course outlines the importance of sedimentary rocks for hydrocarbons, water and as construction materials. Students learn how to describe and interpret sedimentary deposits.

The palaeontology component introduces students to the major fossil groups and to the ways in which organisms can be preserved as fossils. It covers the importance of fossils for the study of evolution, environmental change and earth history. Students learn how to describe fossils and how observations contribute to a broader understanding.

Students will be assessed by means of two practical tests and a theory examination.

INTRODUCTION TO STRUCTURAL GEOLOGY AND GEOLOGICAL MAPS (ENVS156)

Credits: 15 / Semester: semester 2

This module introduces a key subject within Earth Sciences, Structural Geology and Geological Mapping. In this module you will be introduced to geological structures from the micro to the mountain scale, and receive training in the geometrical techniques used to document and analyse them. You will also learn the basic principles of stress and strain which underpin a number of advanced Earth Science subjects and skills used in industry and research. Finally, the module will provide training in how to read and understand geological maps, and train your 3D visualisation skills by learning how to create geological cross-sections from maps, and how to stereographically plot 3D geological data. A combination of virtual lectures, practical skill development sessions, discussion sessions, and directed reading will help you navigate this important Earth Sciences topic. You will be assessed on the development of your practical skills through an end-of-semester open book practical exam, and you will write an individual research paper on a specific topic in structural geology.

STUDY SKILLS AND GIS (EARTH SCIENCE) (ENVS101)

Credits: 15 / Semester: whole session

This module introduces students to the key skills necessary to succeed on a University Earth Science course. It does this via a series of lectures, workshops, and tutorials, together with a geology fieldwork day and attendance at departmental seminars and talks. The lectures, towards the start of the firt semester, cover academic integrity, exam skills, employability and 2D/3D visualisation. Tailored workshops cover Geographical Information Systems (GIS), Word, Excel and programming skills. Small-group (typically 4 to 8 students) tutorials are run by academic staff and cover essay writing, careers and employability. Students receive formative feedback on a practice essay in the first semester before completing one that is summatively assessed, set in the second semester. Academic tutors undertake personal development planning (PDP, i.e. careers and module selection advice) with each tutee. It is recomended that all students attend departmental seminars and the annual Herdman (student-led) conference as these help students integrate into the department and understand the sorts of research and applied activity that takes place.

THEORY AND LABORATORY EXPERIMENTS IN EARTH SURFACES PROCESSES (ENVS165)

Credits: 15 / Semester: semester 2

The module uses a lecture and laboratory-based problem-solving approach to explore some of the fundamental physical and chemical processes underlying physical geography. It is designed to provide a foundation for environmental and physical geography modules in the second and third years.

EARTH MATERIALS (ENVS185)

Credits: 15 / Semester: semester 2

This module will introduce and develop understanding of rock-forming minerals, and other key Earth materials in terms of their environments of formation, occurrence, and abundance. The module will focus on exploring the uses and societal significance of a range of Earth materials, especially those most important for providing sustainable and renewable energy resources and various societal infrastructure. The key practical skill of mineral description, identification and interpretation will be developed and applied throughout the module, to equip students with appropriate skills for many later geoscience modules.

OPTIONAL MODULES

EARTH STRUCTURE AND PLATE TECTONICS (ENVS112)

Credits: 15 / Semester: semester 2

The “Earth structure and plate tectonics” module provides an introduction to the Earth and aim to teach students about:
1) the structure and composition of the Earth, the Earth’s gravitational and magnetic fields, and dynamics within the deep Earth;
2) the physics of Earth material and the geological time scale; and
3) plate tectonics.

ENVIRONMENTAL CHEMISTRY (ENVS153)

Credits: 15 / Semester: semester 2

This module will give students an understanding of the basics that control fundamental properties of elements and matter, either solid, liquid or gas. It will introduce the fundamentals of atomic structure, elements and molecules from simple inorganic to large organic ones and the bonding forces that held them together. It will look at the basics of chemical reactions with processes of oxidation and reduction, solubility of solids and gases, acid-base properties and thermo-chemistry. Students will learn how to make quantitative predictions on e.g. the amount of products that will be produced based on balanced chemical reactions and will see how basic chemistry can be used to explain many environmental properties. Teaching will be delivered through lectures, tutorial sessions and on-line formative quiz with automated feedback. The tutorial session consists in a set of formative exercises with the presence of demonstrator for facilitate individual learning. The module also include revision sessions (run by demonstrators and staff) as well as revision sessions run by Year 2 and/or Year 3 students who have done this module previously. Assessment is done through 3 on-line tests and a final in-person open book exam.

LIVING WITH ENVIRONMENTAL CHANGE (ENVS119)

Credits: 15 / Semester: semester 1

This module examines a number of global scale challenges facing humans on the planet earth related to climate and environmental change.

ESSENTIAL MATHEMATICAL SKILLS (ENVS117)

Credits: 15 / Semester: semester 1

This module is designed to provide students without a A-Level GCE level (or equivalent) background in mathematics a foundation to their degree programme. The module covers pure maths, maths mechanics and statistics developing the required knowledge and skills to be able complete degree programmes in Ocean Sciences, Earth Sciences, Geography, Environmental Science and Marine Biology. The module is taught as weekly lectures following a ten-chapter book developed for the module by world leading experts in the fields. Lectures are supplemented with workshops where concepts can be discussed and skills improved. The module is assessed though online pop-quizzes and a formal written exam.

Programme details and modules listed are illustrative only and subject to change.

YEAR TWO

In year two, students take the following compulsory modules and select two optional modules as outlined below.

Fieldwork involves:

- 15 days split between Scotland and Anglesey (September and Easter)
- 3 days in Nest West England/Wales

COMPULSORY MODULES

APPLIED GEOPHYSICS (ENVS216)

Credits: 15 / Semester: semester 1

This module provides an introduction to the principles and practise of all the main geophysical methods used for exploration purposes. This includes seismic refraction, seismic reflection, electrical methods, ground penetrating radar, gravity, and magnetics. Students will also gain understanding of when and where each method can be useful. Case studies will be used to highlight application of methods on all scales from shallow to deep, small to large and include uses within archaeology, engineering and geology. The module concludes with a synthesis of methods and how to approach site investigation. The module is lecture and problem session based with 50% continuous assessment from set homework assignments or problem sheets. The final exam constitutes the rest of the assessment.

GEOMORPHOLOGY: ICE, SEA AND AIR (ENVS252)

Credits: 15 / Semester: semester 2

The module develops an understanding of these major geomorphic systems and how they create terrestrial landforms. It explores the basic processes that have helped shaping the geomorphology of Britain and investigates magnitude and frequency of events, as well as time and space scales over which the processes operate.

The module is divided into four components, each composed of 4 sessions: glacial systems, glacial geomorphology and environmental change, aeolian processes, and coastal geomorphology . Weekly face-to-face sessions are supported by access to online videos, power point presentations, lecture notes, reading lists and some selected web sites. Weekly timetabled sessions will be a combination of lectures, discussions around reading and Q&A. Two days of fieldwork form the basis of the summative assessment addressing set problems and questions. A formative GIS exercise is also delivered via timetabled support sessions.

MINERALS, MAGMAS AND IGNEOUS GEOCHEMISTRY (ENVS247)

Credits: 15 / Semester: semester 1

This module comprises a series of lectures and practical classes to facilitate students constructing their own learning in the fields of mineralogy, igneous petrology and geochemistry. The module's learning outcomes are assessed by a mid-term class test, creating an individual A3 poster based on a topical case study, and a summative exam.

RESEARCH SKILLS (GEOSCIENCES) (ENVS200)

Credits: 15 / Semester: whole session

The module introduces and develops a range of skills that are central to the research process and the development of key skills important for employment after graduation. The module provides students with the research skills they will need to complete Year 3 dissertation projects. The syllabus is delivered via tutorial sessions and a lecture/workshop series. The tutorials provide a learning environment to support students in discussing key issues and in developing important professional skills. They also provide students with the opportunity of developing a champion – their academic tutor, a member of staff who will get to know them well and be well positioned to write references for employment. The lecture/workshop series covers IT-related skills needed for writing and illustrating reports, consistently citing and referencing data sources, constructing final versions of geological maps, and plotting orientation data, as well as aspects of Careers and Employability. Assessment is coursework-based and comprises an oral presentation, a geological report / literature review, a computer-generated final map poster and a project plan (Gannt chart). As part of this module, students are required to complete dissertation project hazard/risk assessment paperwork. Help and feedback is provided by the academic tutor and technical staff, as well as the module leader.

SEDIMENTARY PROCESSES AND DEPOSITIONAL ENVIRONMENTS (ENVS219)

Credits: 15 / Semester: semester 1

Sedimentary successions are the only archive from which we can accurately decode the Earth's past. Using physical, chemical and biological information we can reconstruct past climates, tectonics and depositional environments. This module teaches the fundamental principles of interpreting sedimentary stratigraphy, and develops students' abilities to recognize sedimentary textures and use them to interpret ancient depositional environments.

FIELD MAPPING TECHNIQUES (ENVS293)

Credits: 15 / Semester: semester 2

This module is a 10 day field class or online equivalent in which students learn various techniques required to assess the 3D geological evolution of an area. Training entails mapping exercises at different scales, designed to develop abilities to visualise geology and geomorphology in 3D, and to analyse and synthesise discrete observations to build a full four-dimensional model that includes the deep-time geological history of the area . Mapping techniques also include notebook construction, to complement any geological or geomorphological map, generalised vertical sections and lithostratigraphy, and the construction of cross-sections for 3D visualisation. These are all skills that are highly regarded and often required by geoscience employers, and this field class also provides the students with several skills required for final year independent research projects. Staff supervise all mapping and technical exercises and provide feedback throughout, but with progressively less direct staff supervision as the module progresses, to encourage independent work as student's skills develop. Group work, when possible, develops the individual's ability to work effectively in a team. Assessment takes place during the field class exercise.

OPTIONAL MODULES

CATCHMENT HYDROLOGY (ENVS217)

Credits: 15 / Semester: semester 1

The study of catchment hydrology is concerned with water above and below the land surface, its various forms, and its circulation and distribution in time and space within drainage catchments; it is based on fundamental knowledge of the hydrological cycle and its governing factors. Understanding the hydrological cycle is fundamental to physical geography. All life is supported by water and all earth systems incorporate fluxes of water to some extent. The module covers the main hydrological processes operating in drainage catchments in terms of their measurement, operation and controlling factors. The module provide 'hands-on' experience of both observing hydrology and modelling hydrological systems, with an emphasis on applied learning, which might be useful in a vocational sense in the future. The module will aim to deliver excellent training in the knowledge required to work in a wide variety of environmentally-facing careers, including those with the EA, Natural England or DEFRA, as well as Environmental Consultancies.

CHANGING ENVIRONMENTS (ENVS214)

Credits: 15 / Semester: semester 1

The Earth is subject to a myriad of threats and stresses, ranging from a changing global climate to unprecedented scales of human impacts on ecosystems, so that a new geological time period, the Anthropocene was created. Placing future change in freshwater and coastal wetlands and lakes into a long-term context is a critical science, and without it, society cannot constrain the 'natural' baseline against which future changes could be judged. This module will provide a critical insight into the global changes currently impacting the Earth over decades to millennial timescales. We will introduce a series of contemporary environmental concerns, and teach how we can reconstruct climatic and environmental conditions, the landscapes and vegetation of the past. We will explore a wide variety of archives (lakes, freshwater and coastal wetlands, oceans) and develop an understanding of the key techniques used to trace environmental conditions (physical properties, biogeochemistry, biological indicators). We will assess how the drivers behind these changes will affect future landscapes and ecosystems.

CLIMATOLOGY (ENVS231)

Credits: 15 / Semester: semester 2

The module covers energy balance and transfer processes at the surface, clouds, rain formation, weather forecasting, monsoons, tropical cyclones, weather in the mid latitudes, and the regional climates. The module has a balance between theory, processes, impacts, and hands-on experimentation and data analysis.

METAMORPHISM AND CRUSTAL EVOLUTION (ENVS212)

Credits: 15 / Semester: semester 2

This module provides second or third year students with a foundation in the whole subject of metamorphism, from how and why atoms move around to form new minerals, through the textures of metamorphic rocks in hand specimen and how to interpret them, to the large scale plate tectonic phenomena that drive everything. Previous study of mineralogy, igneous and structural geology is assumed. Lectures are interactive – the lecturer presents the outline to the audience, takes questions from the audience and students will work up the lecture notes in their own time incorporating material from textbooks. Practicals involve thin section work (the only way to become familiar with metamorphic minerals and textures), hand specimen examination, calculations and the study of metamorphic and other maps of the Caledonian mountain belt in Britain and Ireland. Students will begin by studying the fundamental principles of metamorphic geology and gradually the scale of consideration enlarges until by halfway through the module, we see how metamorphism links to, and informs us about, past and present plate tectonics. We then return to some more detailed techniques for studying metamorphism, and finish by tying all the ideas together in a "case study" of the Caledonides of Britain and Ireland, the eroded remnants of Palaeozoic subduction and collision. Metamorphic geology plays a pivotal role in unravelling this story, as it does in unravelling the history of the entire Earth. Students are assessed during term in using practical skills (thin section drawing, calculations, use of various graphical and pictorial techniques) and through a final theory exam in knowledge and understanding of the subject

STRUCTURAL GEOLOGY AND INTERPRETATION OF GEOLOGICAL MAPS (ENVS263)

Credits: 15 / Semester: semester 2

This module builds on the prerequisite module Introduction to Structural Geology and Geological Maps. While the module introduces additional structures, emphasis is placed on the spatial, kinematic and temporal relationships between geological structures. Strain and stress analysis are developed to a level such that they may be used, as appropriate, to explain the origins of selected geological structures. The module considers the geometries of a series of geological structures and stratigraphies displayed on geological maps and how they should be described and analysed with an emphasis on the interpretation of a geological map as an integrated whole. A combination of lectures, laboratory work and directed reading are used to deliver the module. Twenty lectures will be supported by ten laboratory based practicals. It will be assessed using a theory examination and a practical examination.

VOLCANOLOGY AND GEOHAZARDS (ENVS284)

Credits: 15 / Semester: semester 2

This module comprises a series of lectures, seminars and practical classes to facilitate students constructing their own learning in the fields of volcanology and geohazards. Lectures and guided reading present the scientific, societal, economic and political aspects of volcanic hazards within the wider geohazard context. These themes are then explored further through illustrative case studies, guest seminars and practical exercises.

Programme details and modules listed are illustrative only and subject to change.

YEAR THREE

In year three, students take the following compulsory modules and select four optional modules as outlined below.

Fieldwork involves:

- 35 days field project and dissertation (in the summer between years two and three)
- 14 days in the Betics, Spain (Easter)
- three to five days in North West England

Independent project work involves:

- 35 days independent fieldwork followed by dissertation write-up during semester one, year three.

COMPULSORY MODULES

FIELD PROJECT AND DISSERTATION (ENVS354)

Credits: 30 / Semester: semester 1

Students will demonstrate their scientific skills by planning and undertaking a project with a major component of field study (completed in the summer before Year 3). Once field (and lab) work is complete, they will analyse and write-up their findings under staff supervision, presenting their results as a talk, a dissertation and a poster.

FLUVIAL ENVIRONMENTS (ENVS372)

Credits: 15 / Semester: semester 2

Fluvial processes are found all over the world and are some of the most important in sculpting the Earth's surface and producing landforms. This module examines fundamental concepts and recent ideas relating to fluvial geomorphology, building on study throughout your educational career. A key point about studying fluvial environments is to understand how the system functions, its links and interactions. It is important to look at all the main components of the system, to understand the dynamics and controls on water and sediment flux and how these produce different types of landforms. The amounts of water and sediment can vary with the environmental conditions and thus study of the drivers of these systems such as climate and human activities and how they have changed over time is essential for being able to interpret the current landscape. Understanding of the present functioning of fluvial systems is essential for any environmental management since rain and runoff are ubiquitous and floods are a major natural hazard.

GEODYNAMICS OF THE MEDITERRANEAN (ENVS368)

Credits: 15 / Semester: semester 2

This unique module bridges the gap between geodynamics & crustal evolution (geology) and Earth surface processes (physical geography) and provides a crucial perspective on how to combine these disciplines in the field. The field course itself will take place in southeast Spain but the concepts applied and skills used are transferable to other situations and localities. The module is delivered in the form of weekely seminars. During the field course several days will be spent providing students with the appropriate geological and geomorphological background to the area. This will be followed by assessed, student-led research projects and explanation. Finally the student will generate a comprehensive suite of palaeogeographic maps and an accompanying five-page report that summarises the geodynamic and geomorphological evolution of southeast Spain.

OPTIONAL MODULES

GEOENERGY (ENVS337)

Credits: 15 / Semester: semester 1

Our pathway to a carbon neutral world relies upon our ability to develop new technologies and improve established technologies. Earth Scientists will play a major role in this energy revolution from sourcing raw materials for solar cells and batteries to sequestering carbon dioxide in rock units deep beneath the Earth's surface. This module provides a background to the GeoEnergy sector, with particular focus on fluid flow through geological structures and rock units. The broad aim of the module is to provide students with the appropriate level of knowledge and skillset to be able to evaluate and manage hydrocarbon reservoirs, including carbon dioxide sequestration, and geothermal systems.

CLIMATE CHANGE - A CRITICAL REVIEW (ENVS389)

Credits: 15 / Semester: semester 2

This module examines climate change impacts on humans and ecosystems. The module is designed to give the student a good overview of the strength and weaknesses of climate modelling approaches. Elements of the global carbon cycle are discussed.

ENGINEERING GEOLOGY AND HYDROGEOLOGY (ENVS338)

Credits: 15 / Semester: semester 1

This module provides the basic principles of engineering geology and hydrogeology. The applications of these principles are illustrated using selected examples and emphasis is placed on the interaction between them and their control on the mechanical stability of natural systems. By necessity predictions must be quantitative but, in order to develop understanding, a strongly graphical approach has been adopted in this module. The applications of engineering geology and hydrogeology will be highlighted using a field-based case study: the Mam Tor landslip. Engineering geology and hydrogeology are two important sources of employment and this module provides an opportunity to experience the scope and nature of these subjects. A combination of lectures, directed reading, laboratory work and fieldwork are used to deliver the module. Twelve lectures will be supported by six laboratory based practicals. It will be assessed using a report of the field investigation and an examination.

INTRODUCTION TO QUATERNARY MICROPALAEONTOLOGY (ENVS342)

Credits: 15 / Semester: semester 2

This module intends to give a holistic insight of a number of marine and terrestrial microfossils that are conventionally used for reconstructing past environmental conditions for the Quaternary period, including recent past. Microfossils are biological indicators that can help to either qualitatively and/or quantitatively estimate environmental conditions such as atmospheric temperature and precipitation (pollen), sea-surface conditions (foraminifera, diatoms, radiolarians, dinoflagellate cysts), salinity (ostracods, diatom), pH (diatoms), sea-ice cover (diatoms, dinoflagellate cysts), etc. These conditions are of paramount importance for modelling past climate conditions and the data derived from microfossil assemblages enable to better calibrate models, which in turn, are essential to forecast future climate. In addition, microfossil assemblages help to understand the natural evolution of our environment as well as measuring the amplitude of human activities over time.

MINERAL RESOURCES (ENVS326)

Credits: 15 / Semester: semester 2

This module aims to provide understanding of the major types of mineral deposit through a critical assessment of conceptual models of deposit forming processes. There is an emphasis on geochemistry and quantitative methods. Content is delivered through on-line lectures with the aim of understanding: how mineral resources are formed; synthesising their distribution in space and time and evaluating this distribution in relation to overall Earth evolution; considering sustainability and the role of economics and politics. Practical understanding of mineral exploration is achieved through team-based role-playing activities in which students are divided into exploration companies. Each company has a two-stage budget and has to decide how to spend it on sampling, mapping, geochemical analysis, trenching and drilling. Each team presents an interim verbal report on the first stage followed by a second-stage final executive report summarising findings and providing an evaluation of gold resource. Assessment is split between the team exploration project (50%) and a final coursework essay (50%) from a choice of three topics. The team project uses peer assessment to produce individual marks for team members. This module has encouraged many students to follow mineral exploration careers.

NATURAL HAZARDS AND SOCIETY (ENVS319)

Credits: 15 / Semester: semester 1

This module aims to provide an integrated perspective on a range of natural hazards, the different levels of impact on human societies, and the mitigation and adaptation strategies adopted before, during and after extreme events. At the end of this module students will have an understanding of the physical processes and societal impacts associated with a range of geophysical and meteorological hazards. The course is delivered in a series of lectures supported by tutorial sessions and is assessed by an exam and coursework assignment.

SIMULATING ENVIRONMENTAL SYSTEMS (ENVS397)

Credits: 15 / Semester: semester 2

This module will teach students to write and use simple numerical forward models of environmental systems, including geomorphic, geophysical, oceanographic and ecological models. Successful students will develop important transferrable coding and numeracy skills through a series of lectures, seminars and practical work. The module will be assessed through practical work only, with formative feedback throughout to help develop the necessary skills.

THE LIVING, EVOLVING EARTH (ENVS320)

Credits: 15 / Semester: semester 1

This module looks at long term evolutionary patterns and the links between the evolution of life, climate and environmental change. Building on the basics of palaeontology covered in ENVS118, this module could be subtitled "palaeontology for palaeontologists" since it covers topics and ideas that are used day-to-day by professional palaeontologists. The course deals with evolutionary theory and its place in palaeontology, as the student learns how to read and construct evolutionary hypotheses, and describe and understand patterns in the fossil record. In addition the module will explore key events in the history of life on Earth – changing fossils on a changing planet – using exceptionally preserved faunas to illustrate the evolution of the flora and fauna. The module is delivered through lectures and practical sessions. The practicals are a key component of the module and are designed to run alongside and support the lecture material, giving the student the opportunity to more deeply understand the module content. Once the bulk of the practicals are completed, students are required to undertake a group project that brings together much of the course material into a coherent whole.

Programme details and modules listed are illustrative only and subject to change.

YEAR FOUR

COMPULSORY MODULES

ADVANCED GEOLOGY AND GEOLOGY-PHYSICAL GEOGRAPHY PROJECT (ENVS405)

Credits: 45 / Semester: whole session

In this module students will carry out their final year independent research project based on laboratory analyses and/or modelling and fieldwork. It is specifically designed to enable students to develop and demonstrate independent research skills and transferable skills valuable to employers. The module will develop critical thinking, research level understanding of current debates in the geosciences and knowledge of the use and applications of specialised cutting-edge research equipment and facilities.

Each student is supervised by one or more academic members of staff who offer guidance during the period of independent research carried out by the student. The Module Manager offers support on paper writing and communication skills as well as additional academic support, if needed.

The module entails the production of a literature review paper that is relevant to each individual project; a talk to communicate the research undertaken to a mixed audience of UGs, PGTs, Postdocs and Academic staff; the final dissertation in manuscript format.

RESEARCH METHODS (ENVS444)

Credits: 15 / Semester: semester 1

This module is designed to train our students, largely by personal practice, in: scientific, journal-style writing; the initial development of a research problem and the definition, presentation and defence of a research proposal; the use of a small number of lab-analytical and data-analytical techiques of broad relevance to Advanced Geology and Geology-Physical-Geography projects.

CURRENT ISSUES IN EARTH SCIENCE (ENVS440)

Credits: 15 / Semester: semester 1

This module covers geoscience topics that have current societal importance. It will promote independent thinking, critical insight and a sound understanding of a variety of current geoscience topics that affect local, national and international governance. The module will allow development of independent research skills and encourage effective communication with a variety of different stakeholders (governing bodies, public, companies).

The module is delivered as a series of lectures, seminars and workshops. Lectures will introduce some high-level current issues in earth science, followed by progressively more student-led seminars and workshops, where they present their work and debate issues with other students in the class. Feedback from these seminars/debates informs them on how to write their consultancy reports, and deliver the group presentation.

APPLIED GEOLOGY AND GEOHAZARDS OF THE CANARY ISLANDS (ENVS575)

Credits: 15 / Semester: semester 2

This module comprises a series of lectures, seminars, and a field class to facilitate students constructing their own learning.
Lectures and guided reading present the theoretical framework of key topics and controversies. A field class promotes a deep understanding of the scale of geological and geohazard analysis particular to Tenerife. Ideas, concepts and knowledge built in the field act as stimuli to carry out independent and group investigations of select topics. An independent hazard assessment is prepared, communicating the findings in a report to local decision-makers (including executive summary). Primary field evidence is applied to critically discuss controversial topics in geology and geohazards.

OPTIONAL MODULES

ENGINEERING GEOLOGY AND HYDROGEOLOGY (ENVS538)

Credits: 15 / Semester: semester 1

This module provides the principles of engineering geology and hydrogeology. The applications of these principles are illustrated using selected examples and emphasis is placed on the interaction between them and their control on the mechanical stability of natural systems. By necessity predictions must be quantitative but, in order to develop understanding, a strongly graphical approach has been adopted in this module. The evaluation of errors in natural datasets an their impacts on quantitative predictions will be considered. The applications of engineering geology and hydrogeology will be highlighted using a field-based case study: the Mam Tor landslip. Engineering geology and hydrogeology are two important sources of employment and this module provides an opportunity to experience the scope and nature of these subjects. A combination of lectures, directed reading, laboratory work and fieldwork are used to deliver the module. Twelve lectures will be supported by six laboratory based practicals. It will be assessed using an individual report of the field investigation and an examination.

MINERAL RESOURCES (M) (ENVS526)

Credits: 15 / Semester: semester 2

This module aims to provide understanding of the major types of mineral deposit through a critical assessment of conceptual models of deposit forming processes. There is an emphasis on geochemistry and quantitative methods. Content is delivered through on-line lectures with the aim of understanding: how mineral resources are formed; synthesising their distribution in space and time and evaluating this distribution in relation to overall Earth evolution; considering sustainability and the role of economics and politics. Practical understanding of mineral exploration is achieved through team-based role-playing activities in which students are divided into exploration companies. Each company has a two-stage budget and has to decide how to spend it on sampling, mapping, geochemical analysis, trenching and drilling. Each team presents an interim verbal report (seminar style) on the first stage followed by a second-stage final executive report summarising findings and providing an evaluation of gold resource and potential environmental impact. Assessment is split between the team exploration project (45%), sustainability seminars (10%), and a final coursework essay (45%) from a choice of two synoptic topics. The team project uses peer assessment to produce individual marks for team members. This module has encouraged many students to follow mineral exploration careers.

PHYSICAL PROPERTIES OF ENVIRONMENTAL ARCHIVES AND MODELLING APPROACH (ENVS433)

Credits: 15 / Semester: semester 1

This module introduces the theory and practice of a number of advanced analytical methods which are commonly applied to a wide range of sedimentary archives. It will also teach how to use laboratory techniques in combination in order to produce environmental reconstructions from core sediments usually collected during the Field Class (ENVS425). The module will focus on two aspects: 1) the physical properties of sediment archives in view of establishing records of environmental changes; 2) the modelling approaches for assessing impact of environmental changes.

RESEARCH IN ANTHROPOCENE ENVIRONMENTS (ENVS485)

Credits: 15 / Semester: semester 1

Research in Anthropocene Environments provides an opportunity for students to be introduced to, and focus on a wide range of potential topics at an early stage in their MSc studies, providing insight into how research spanning this broad theme is undertaken. The only condition for the topic that students select is that it addresses an aspect of an Anthropocene environment (defined here as one which is directly or indirectly human influenced). It is delivered by staff from across the School of Environmental Sciences whose research is intimately linked to the module title, also allowing students to gain a better insight into the wide range of topics that fall under this theme and what research is done in the school. Staff also talk briefly about their own paths into academia to highlight how research ideas and interests evolve. It is assessed by an abstract and a combined large poster/short oral presentation. The latter occurs during a day of presentations, which is designed to mimic an academic conference.

THE LIVING, EVOLVING EARTH (ENVS520)

Credits: 15 / Semester: semester 1

This module looks at long term evolutionary patterns and the links between the evolution of life, climate and environmental change. Building on the basics of palaeontology covered in ENVS118, this module could be subtitled "palaeontology for palaeontologists" since it covers topics and ideas that are used day-to-day by professional palaeontologists. The course deals with evolutionary theory and its place in palaeontology, as the student learns how to read and construct evolutionary hypotheses, and describe and understand patterns in the fossil record. In addition the module will explore key events in the history of life on Earth – changing fossils on a changing planet – using exceptionally preserved faunas to illustrate the evolution of the flora and fauna. The module is delivered through lectures, practical sessions and seminars. The practicals are a key component of the module and are designed to run alongside and support the lecture material, giving the student the opportunity to more deeply understand the module content. Once the bulk of the practicals are completed, students are required to undertake a group project that brings together much of the course material into a coherent whole.

INTRODUCTION TO QUATERNARY MICROPALAEONTOLOGY (ENVS542)

Credits: 15 / Semester: semester 2

This module intends to give a holistic insight of a number of marine and terrestrial microfossils that are conventionally used for reconstructing past environmental conditions for the Quaternary period, including recent past. Microfossils are biological indicators that can help to either qualitatively and/or quantitatively estimate environmental conditions such as atmospheric temperature and precipitation (pollen), sea-surface conditions (foraminifera, diatoms, radiolaria, dinoflagellate cysts), salinity (ostracods, diatom), pH (diatoms), sea-ice cover (diatoms, dinoflagellate cysts), etc. These conditions are of paramount importance for modelling past climate conditions and the data derived from microfossil assemblages enable to better calibrate models, which in turn, are essential to forecast future climate. In addition, microfossil assemblages help to understand the natural evolution of our environment as well as measuring the amplitude of human activities over time.

GEOENERGY (ENVS537)

Credits: 15 / Semester: semester 1

Our pathway to a carbon neutral world relies upon our ability to develop new technologies and improve established technologies. Earth Scientists will play a major role in this Energy revolution from sourcing raw materials for solar cells and batteries to sequestering carbon dioxide in rock units deep beneath the Earth's surface. This module provides a background to the GeoEnergy sector, with particular focus on fluid flow through geological structures and rock units. The broad aim of the module is to provide students with the appropriate level of knowledge and skillset to be able to evaluate and manage hydrocarbon reservoirs, including carbon dioxide sequestration, and geothermal systems.

SIMULATING ENVIRONMENTAL SYSTEMS (ENVS597)

Credits: 15 / Semester: semester 2

This module will teach students to write and use simple numerical forward models of environmental systems, including geomorphic, geophysical, oceanographic and ecological models. Successful students will develop important transferrable coding and numeracy skills through a series of lectures, seminars and practical work. The module will be assessed through practical work only, with formative feedback throughout to help develop the necessary skills.

Programme details and modules listed are illustrative only and subject to change.

HOW YOU'LL LEARN

Teaching takes place through lectures, practicals, workshops, seminars, tutorials and fieldwork, with an emphasis on learning through doing. The award-winning Central Teaching Laboratories, provide a state-of-the-art facility for undergraduate practical work. Students value the learning opportunities provided by field classes, including the rapid and detailed feedback on performance.

You will typically receive 15-20 hours of formal teaching each week, and complete between 50 and 100 days of residential fieldwork over the course of their programme. In Years Three and Four you will carry out independent research projects on a topic and location of your choice. All projects are supervised by a member of staff who will meet with you on a weekly, or more frequent, basis.

A number of the School's degree programmes involve laboratory and field work. The field work is carried out in various locations, ranging from inner city to coastal and mountainous environments. We consider applications from prospective students with disabilities on the same basis as all other students, and reasonable adjustments will be considered to address barriers to access.

HOW YOU'RE ASSESSED

Assessment matches the learning objectives for each module and may take the form of written exams, practical laboratory and computer examinations, coursework submissions in the form of essays, scientific papers, briefing notes or lab/field notebooks, reports and portfolios, oral and poster presentations and contributions to group projects, and problem-solving exercises. Assessment is via tasks that mirror those graduate students are likely to undertake working as professional geoscientists. For example, generating and interpreting quantitative spatial data, with appropriate consideration of inherent uncertainty, is a key task and necessary skill for professional environmental geoscientists, and this skill is developed and assessed on several programme modules, especially field and lab-based modules. As well as being authentic in terms of the underlying purpose of the assessed task, assessment tasks are also authentic in terms of format, intended audience, resources used, and collaborative team elements. For example, team-based environmental assessment work with professional format delivery appropriate for presentation to management-level colleagues using state-of-the-art field, lab or IT resources is central to assessments in field classes.

LIVERPOOL HALLMARKS

We have a distinctive approach to education, the Liverpool Curriculum Framework, which focuses on research-connected teaching, active learning, and authentic assessment to ensure our students graduate as digitally fluent and confident global citizens.

Careers and employability

There has never been a better time to study Earth sciences. Many of the fundamental questions of our times will be answered by geoscientists, as we seek to provide sustainable resources for the world's population, as well as predict and mitigate climate change and natural hazards by building a better understanding of the planet on which we live.

The majority of our recent graduates have gained employment within a degree-related field or continued within further education after graduation. We have close links with geoscience and environmental industries ensuring that our degrees properly equip you for future employment. The truly interdisciplinary nature of our degrees additionally makes graduates in Earth sciences highly sought after by other employment sectors.

89.5% **OF ENVIRONMENTAL SCIENCES STUDENTS ARE IN WORK AND/OR FURTHER STUDY 15 MONTHS AFTER GRADUATION.**

Discover Uni, 2018-19.

PREPARING YOU FOR FUTURE SUCCESS

At Liverpool, our goal is to support you to build your intellectual, social, and cultural capital so that you graduate as a socially-conscious global citizen who is prepared for future success. We achieve this by:

- Embedding employability within your curriculum, through the modules you take and the opportunities to gain real-world experience offered by many of our courses.
- Providing you with opportunities to gain experience and develop connections with people and organisations, including student and graduate employers as well as our global alumni.
- Providing you with the latest tools and skills to thrive in a competitive world, including access to Handshake, a platform which allows you to create your personalised job shortlist and apply with ease.
- Supporting you through our peer-to-peer led Careers Studio, where our career coaches provide you with tailored advice and support.

Fees and funding

Your tuition fees, funding your studies, and other costs to consider.

TUITION FEES

Tuition fees cover the cost of your teaching and assessment, operating facilities such as libraries, IT equipment, and access to academic and personal support. Learn more about tuition fees, funding and student finance.

UK fees **Also applies to Channel Islands, Isle of Man and Republic of Ireland**	
Full-time place, per year	£9,250
Year in industry fee	£1,850
Year abroad fee	£1,385

International fees	
Full-time place, per year	£25,350

*Fees stated are for the **2023-24** academic year.*

ADDITIONAL COSTS

We understand that budgeting for your time at university is important, and we want to make sure you understand any course-related costs that are not covered by your tuition fee. This includes the cost of a geological field kit, dissertation expenses, and optional field classes in year three.

Find out more about the additional study costs that may apply to this course.

SCHOLARSHIPS AND BURSARIES

We offer a range of scholarships and bursaries to help cover tuition fees and help with living expenses while at university.

Scholarships and bursaries you can apply for from the United Kingdom

Select your country or region for more scholarships and bursaries.

Entry requirements

The qualifications and exam results you'll need to apply for this course.

Your qualification	**Requirements** About our typical entry requirements
A levels	AAB Applicants with the Extended Project Qualification (EPQ) are eligible for a reduction in grade requirements. For this course, the offer is **ABB** with **A** in the EPQ. You may automatically qualify for reduced entry requirements through our contextual offers scheme.
GCSE	4/C in English and 4/C in Mathematics
Subject requirements	Including one science subject. Acceptable sciences : Maths, Further Maths, Physics, Chemistry, Biology, Geology, Geography, Environmental Science, Applied Science. For applicants from England: For science A levels that include the separately graded practical endorsement, a "Pass" is required.
BTEC Level 3 National Extended Diploma	Not accepted. Applicants should apply for F6F8
International Baccalaureate	35 points with no score less than 4, inc. one science at Higher Level
Irish Leaving Certificate	H1, H1, H2, H2, H2, H3 including H2 or above in one science

Your qualification	Requirements About our typical entry requirements
Scottish Higher/Advanced Higher	Not accepted without Advanced Highers at AAB including one science subject.
Welsh Baccalaureate Advanced	Accepted at Grade B with AA, inc. one science A Level.
Access	Not accepted. Applicants should apply for F6F8
International qualifications	Select your country or region to view specific entry requirements. Many countries have a different education system to that of the UK, meaning your qualifications may not meet our entry requirements. Completing your Foundation Certificate, such as that offered by the University of Liverpool International College, means you're guaranteed a place on your chosen course.

ALTERNATIVE ENTRY REQUIREMENTS

- If your qualification isn't listed here, or you're taking a combination of qualifications, contact us for advice
- Applications from mature students are welcome.

THE ORIGINAL REDBRICK